Two Universities, Two Patent Ownership Regimes: What Is the Difference for Knowledge Transfer?

Tõnis Mets¹, Aleksei Kelli², Lars Jonsson³
¹Centre for Entrepreneurship, University of Tartu
Narva rd. 4, EE-51009 Tartu, Estonia
E-mail: Tonis.Mets@ut.ee
²Faculty of Law, University of Tartu
Kaarli 3, EE10119 Tallinn, Estonia
E-mail: Aleksei.Kelli@ut.ee
³Uppsala University Innovation
Dag Hammarskjölds väg 10B, 75183 Uppsala, Sweden
E-mail: Lars.Jonsson@uuinnovation.uu.se

Abstract

It is widely accepted that an intellectual property (IP) system enhances innovation. However, the functioning of a national innovation system (NIS) and the interaction of its stakeholders in the context of industry-academia knowledge transfer (KT) differs among countries depending on their economic, social-cultural, legal and historical background.

This article comparatively analyzes the knowledge transfer systems of Uppsala and Tartu universities. The findings demonstrate that a university IP ownership regime (institutional ownership vs. professor’s privilege) does not have a considerable impact on knowledge transfer. Organizational capabilities, structured knowledge management and other components of knowledge transfer infrastructure have proved to be more important.

Keywords: intellectual property (IP) system, academic patenting, university-industry knowledge transfer

Introduction

Although the actual impact of intellectual property (IP) protection on innovation and economic growth is not entirely clear (for further discussion, see Léger, 2007; Andersen, 2004) it is a widespread understanding that IP system enhances innovation. This, however, does not mean that there are no challenges relating to the contemporary IP system and its utilization. Intellectual property is traditionally defined as legal rights resulting from intellectual activity (Convention Establishing the World Intellectual Property Organisation). It has been explained that information constitutes the subject matter of IP protection (Cornish, Llewelyn, 2007, p. 6; Drahos sine anno, p. 2). From a legal perspective, IP system is established by international, regional and national rules. International and transnational rules determine the subject matter, criteria and standards of protection, and limitations of IP. National rules regulate ownership, IP contracts and enforcement. On the one hand, IP system is international and is implemented in the majority of countries around the world according to one-size-fits-all approach. The problem is that IP system is a component of national innovation system (NIS) (for further discussion on NIS, see Freeman, 1995; Lundvall, 2007) and therefore it is crucial to consider the local socio-economic conditions. On the other hand, when we look at Europe then different cultural (incl. linguistic) traditions, national economic conditions and national IP rules (even within the EU) cause fragmentation of the market.

One of the main objectives of IP system is to motivate individuals to create new knowledge by granting them a certain exclusivity to exploit the knowledge for the determined period. The novelty of knowledge realized in inventions is usually the result of inventors’ research and development (R&D) efforts. Inventions are often protected in the form of patents. The patent system enables market expansion by licensing and thereby diffuses knowledge and excludes patent owners from competition (Ordever, 1991). Diffusion of new knowledge by licensing allows its implementation in industry and results in monetary and non monetary benefits for patent owners. Knowledge diffusion is reinforced by the disclosure requirement (inventions must be sufficiently disclosed in patent applications), time limits and territorial character of patent rights which are all inseparable components of the patent system.

The growing importance of new scientific knowledge in modern economic development has lead to changes in structure of actors and linkages between them in innovation and IP systems. Universities and public research
institutions are traditionally seen as creators of new knowledge in society. As a rule they do not have a business interest in a specific field of knowledge production (private R&D funding institutions, for example, can have), but in the last 20-30 years the meaning of patents for universities has changed and universities have started to act as quasi-entrepreneurs.

There are three well-known alternative ways in innovation system for conveying the achievements of university science into the economy of a region (Lambert, 2003, p. 47; Audretsch, Thurik, Verheul, 2002; Formica, Mets, Varblane, 2008):

1) spin-offs based on new technological ideas from (university) professors;
2) high-level sales of licenses for new technologies; and
3) knowledge spillover effects.

The first two options of knowledge transfer almost always contain patented technical solutions or know-how. IP protection in university-industry collaboration depends on the combination of partners’ mutual interests, but also on how the government develops its innovation policy and NIS generally.

To begin with, we ought to recognize that IP system includes in addition to internationalizing standardized legal regulations also actors and their relations, path dependent traditions and behavioral patterns which can result in different models linking IP system and innovation.

The article aims to explore knowledge transfer practices within different IP framework by universities of small country origin in commercialization of their R&D. For this purpose, the authors analyze IP ownership regimes and their impact on knowledge transfer from the university to industry; introduce sample universities and methodology of the current case study research. Finally the results of the empirical research and discussion are presented. The article ends with conclusions.

**Intellectual property strategies and ownership in commercialization of university R&D**

IP protection and exploitation have become inseparable components of the concept of entrepreneurial university. Entrepreneurial university has sometimes been conceptualized as “a university that has developed a comprehensive internal system for the commercialisation and commodification of its knowledge” (Jacob et al., 2003). Entrepreneurial university can also be defined as a university taking an active role in (regional) economic development (for further discussion on entrepreneurial university, see Clark, 2001; Etzkowitz, 2004). Entrepreneurial universities have to follow patenting patterns which are similar to those of private companies. Universities participate in the knowledge business but are not actors on a real market of goods and services, therefore they should have patenting patterns which are more comprehensive and aim to identify opportunities and challenges. The objectives of strategic patenting are not confined to getting exclusive rights but extend to defensive and offensive patenting (Arundel, Patel, 2003). The reach through patent strategy is sometimes utilized to monopolize future technologies even though at the moment of filing a patent application there is only a vague understanding of possible products (Petrusson, 2004, p. 113). The utilization of the described strategies could discourage potential competitors and prevent technological developments and thereby has an adverse impact on innovation and technological progress slowing it down or even blocking in some fields (Takalo, Kannainen, 2000). In order to avoid monopolization and blocking future technologies it has been suggested that universities should mainly patent inventions which are close to commercial use (Nelson, 2003).

Universities can also choose not to patent their inventions but to publish or keep them secret. The strategic decision whether to use patents, trade secrets or publish potentially protectable inventions depends on organizations’ capabilities to enforce their rights and market value of knowledge (Xu, 2004). One the one hand, publishing all research results guarantees wide dissemination of knowledge and avoids problems relating to patent enforcement and maintenance of confidentiality. Knowledge can also be published for defensive purposes (defensive publishing) to make patenting of certain inventions impossible (patentable inventions must be new). On the other hand, without IP rights which establish control over knowledge, no one is really interested to invest in it. The issue has been described in literature as follows: “in the absence of patents, government funded research results would languish underutilized – underdeveloped and undercommercialized – because (1) the researchers and their host institutions lacked the incentives and/or capacity to further develop and commercialize the research or to transfer the research results to industry, and (2) even if transfer was feasible, industry lacked sufficient incentives to invest in development and commercialization without the exclusivity made available by
patents in the form of exclusive licenses” (Frischmann, 2005, pp. 27-28). Therefore it can be said that knowledge transfer strategy based solely on publishing is not the best one.

Another option to manage knowledge transfer is to utilize trade secret protection. Several authors have pointed out that in the business context the size of a company could be an important factor influencing the IP strategy. Bigger companies have more resources to patent and handle patent infringement than SMEs (see e.g. Arundel, Patel, 2003; Blind, Edler, Frietsch, Schmocha, 2006). Trade secret protection has been seen as a viable option for SMEs in some cases (Kelli et al, 2010; Mets et al, 2007). When analyzing an academic setting, it can be concluded that due to teaching, publishing articles and evaluation of academic personnel confidential information could easily be divulged. Knowledge transfer (e.g. through license agreements) can also be more efficiently managed if core knowledge is protected by patents and additional know-how is protected as trade secrets.

The ownership regime of research results is another factor which needs to be considered in managing knowledge transfer. It is possible to distinguish two regimes: the institutional ownership (academic inventions are owned by the university) and the professor’s privilege/teacher’s exemption (academic inventions are owned by researchers). American and European universities have had different approaches concerning ownership regimes. When in the pre-Bayh-Dole era research results were often owned by governmental agencies funding academic research or industrial sponsors (for further discussion on historical background, see Mowery et al, 2001) then in Europe the concept of professor’s privilege prevailed. Despite historic differences the development in America as well as Europe has been towards the concept of institutional ownership. The majority of countries have adopted regulations according to which academic inventions are owned by the university (institutional ownership).

American universities have been leading in patenting since the adoption of the Bayh-Dole Act in 1980 which entitles universities to own patents arising from federal research (Siegel, Waldman, Atwater, Link, 2004). As a result of the Bayh-Dole Act the share of universities’ patents in USA increased almost twice to 2.5% in 1990 (Henderson et al, 1998). The share of European universities in the total number of applications to the European Patent Office (EPO) from their country of origin was between 0.1% (Sweden) and 12.3% (Belgium) in 2003-2004, Germany (~0.6%) and Italy (~1.2%) ranking lower, Spain (~4.3%) and UK (~5.8%) higher (Van Zeebroeck, Van Pottelsberghe, Guellec, 2008). Low level of patenting by some universities could be explained by the existence of professor’s privilege (Sweden) or having just abandoned that regime (Germany) (ibid). The topic is partly covered by the comparative survey in Eastern and Western part of Germany (Von Ledebur, 2009). Up to 2002 academic personnel in Germany had the right to transfer inventions to industry by licensing it as their own. Since 2002 universities acquire the ownership of an invention made by researchers similarly to private companies (Goddar, 2005). The main aim of the legal reform was to enhance technology transfer. The transaction costs, however, have increased since a third party (university) is involved (Von Ledebur, 2009).

A study of professor’s privilege (Lissoni, Lotz, Schovsbo, Treccani, 2009) focusing on smaller countries reveals that over the years following the change of system from the professor’s privilege to the institutional ownership in Denmark in 2000 (for further discussion on Danish reform, see Baldini, 2006), a considerable amount of patenting activities have moved out from the professors’ hand into universities. The total share of university ownership of academic patent applications (i.e. patent applications on inventions created within employment at university) grew from 5.6 to 20% but a more considerable share of 72.9% remained with companies. In Sweden which still has the professor’s privilege, universities’ share was 4.9%, companies’ share 81.1% and individuals’ share 13.5% (ibid). Universities’ share in ownership of academic patents in Germany increased to approx. 70% after 2002 (Von Ledebur, Buenstorf, Hummel, 2009) reaching similar numbers to those in US (Lissoni, Lotz, Schovsbo et al, 2009). Von Ledebur, Buenstorf and Hummel (2009) suggest that there is no evidence of systematic increase in the numbers of academic patenting since 2002. The adaption of institutional ownership could have created even additional obstacles to technology transfer because before the reform a bigger share of academic patents belonged to the companies which means that knowledge had already been transferred to the industry. Now, however, many patents remain within academia and are never licensed to the industry.

All the leading Estonian universities in public law have adopted regulations which provide that the university has the right to patent research results (for further discussion, see Pisuke, Kelli, 2007). In some cases, the university can waive the right to patent an academic invention in favor of the inventor(s). The reason could be
that the university does not see any potential in the invention, lack resources or/and evaluation competences (for further discussion, see Mets, 2010b).

The authors are not of the opinion that the ownership regime has a tremendous impact on knowledge transfer. The professor’s privilege and institutional ownership have both their strengths and weaknesses. There is no clear answer which of the systems is better. The system of professor’s privilege has several advantages. For instance, it gives researchers more freedom to exploit their knowledge and makes Swedish universities attractive to foreign researchers. Some foreign companies prefer to collaborate with Swedish universities because of the professor’s privilege which make it easier for the company to control the IPR management in the collaboration. The system of professor’s privilege also has low administrative costs (no need to monitor whether researchers notify the university of new inventions) and requires the knowledge transfer personnel to be more efficient because otherwise the researcher would not use its services. One of the main advantages of institutional ownership is that the industry partner can negotiate with one institution instead of many individual researchers (the university as one-stop-shop). The downsides of institutional ownership relate to high administrative and financial cost of the system. The university has to monitor whether new inventions are reported and enforce its rights if researchers unlawfully try to patent inventions outside the university (e.g. by giving ownership to a company he or she owns or for financial benefit). Poor knowledge management at the university could also create a vicious circle which leads to underutilization of research results. If the university cannot exploit knowledge then it results in de facto professor’s privilege. If researchers lack the necessary capabilities then knowledge is very likely published and underutilized since no-one invests in it. Leaving the university out of the process only strengthens the de facto professor’s privilege and the whole process starts over. Therefore, it is vital for the institutional ownership system that the knowledge transfer personnel are on a high professional level. The de facto professor’s privilege is also a factor which needs to be considered when analyzing the statistics on university patents.

Attributes of knowledge creation and knowledge transfer at university

The creation of new knowledge for society as the fulfillment of the mission of entrepreneurial university requires its measurement as well. The most popular and convenient way is to search and count papers in ISI databases. They cover approximately 80% of publications in science and technology (the same cannot be said about social sciences). The evaluation of knowledge production of researchers and universities is generally based on the quantity (number of publications) and quality (ranking of journals containing publications and citation frequency) of papers. The publications in the journals listed in ISI Web of Science are usually more valuable than articles in other journals. The hierarchy also exists among them. It is based on the impact factor or rankings of journals by authoritative institutions. These are the most popular criteria applied when considering candidates for academic positions and research grants.

Knowledge production is partly related to metrics for ranking of universities. One of the best known examples of such ranking is the Times Higher Education (THE: http://www.timeshighereducation.co.uk/world-university-rankings/). There are also other systems such as the recently created Academic Ranking of World Universities (ARWU) published annually by the Shanghai Jiao Tong University (http://www.arwu.org/) and QS World University Rankings® (http://www.topuniversities.com/). The Noble Prize as the highest recognition is not discussed here.

Consideration of patents and knowledge transfer activities as academic evaluation criteria has developed over the last ten to fifteen years. It is done in a hesitant manner and frequently questioning whether patenting has an adverse impact on research quality and publication productivity and is in conflict with academic freedom (Van Zeenbroeck, Van Pottelsberge, Guellec, 2008). This opinion is disputed by several researchers. The research of Breschi, Lissoni and Montabio (2007) reveals that academic inventors exhibit superior productivity in publishing even in basic-science-oriented journals. They also benefit from financial or cognitive resources of technology-oriented projects. As a rule, similar systems of indicators are used to measure knowledge transfer at American and European universities. There are, however, some differences which decrease the comparability of two different samples (Gardner, Fong, Huang, 2007). General metrics can be divided into two types (ibid):

- Primary metrics: (1) number of invention disclosures; (2) number of US patent applications; (3) number of licenses executed; (4) total income from licenses; (5) number of established start-up companies;
• Secondary metrics: (1) value of sponsored research expenditures; (2) number of US patents issued; (3) number of active licenses; (4) total income from royalties; (5) number of full-time professionals in knowledge/technology transfer offices; (6) legal expenditures on protection of IP.

The analysis of the indicators reveals the conditions in which they can be implemented. Comparing European and US universities, researchers have found that European academic patenting differs from US practice in respect of dominance of business ownership on academic patents reaching more than 60 per cent of the total number of academic patents (Lissoni, Llerena, McKelvey, Sanditov, 2009). There are also differences among countries related to the ownership regime of academic inventions. For instance, Swedish researchers enjoy professor’s privilege (*ibid*). It means that patent ownership in European universities becomes a specific topic for evaluation.

**Methodology**

The analysis in this article concentrates on the cases of two European universities: Uppsala University (1477) in Sweden and the University of Tartu (1632) in Estonia. Although they were both founded as Swedish universities (Estonia was part of the Swedish Empire at that time), the historical background is not the main reason why the authors have chosen them. They were chosen due to differences in intellectual property ownership regimes (professor’s privilege and institutional ownership), structuring of knowledge transfer processes and economic background. The comparison of two universities in that context provides valuable insights into developing industry-academia collaboration further.

To some extent the selection was also inspired by the mutual visits and meetings of innovation specialists from five European universities initiated by the head of Uppsala University Innovation (UUI) Dr. Lars Jonsson in December 2007. The so-called Uppsala Round-table (Mets, 2010a) includes four old classical universities in addition to Uppsala and Tartu: Groningen (the Netherlands, 1614), Helsinki (Finland, 1640), and one much younger University of Linköping (Sweden, 1975). Three of them, Groningen, Uppsala and Tartu, belong to the Coimbra Group of European multidisciplinary universities of high international standard (http://www.coimbragroup.be/index.html). Location in small countries is also a characteristic feature of all these universities.

The main theme for the Uppsala Round-table has been the search for opportunities to enhance knowledge transfer systems at university. After the three-year period of joint meetings and seminars as a follow-up event, Uppsala University Innovation served as the evaluator of commercial potential of R&D results for two Estonian leading universities – the University of Tartu and Tallinn University of Technology. All these preparatory events motivated the authors to carry out the following comparison. Aleksei Kelli, Associate Professor of IP Law from the University of Tartu, spent two months in 2011 in Uppsala learning more about different procedures used by UUI and gathering material for two comparative case studies. Valuable expertise concerning knowledge transfer at Uppsala University was provided by Dr. Lars Jonsson.

In the current study all the main publicly available data (*e.g.* on the internet) describing these universities, their R&D and environment were mapped. The aspects not sufficiently covered were specified by individual communications with knowledge transfer specialists of the universities. Due to the confidentiality requirements part of IP related financial information specified in the section is not presented. To some extent the criteria for indicators of knowledge/IP transfer at the universities are different. For example, the status of a spin-off company according to regulations at Tartu University does not require active contribution of the university to a new company. But, Uppsala Innovation is, however, directly contributing to new companies. Therefore, the authors’ aim is to present comparable data for both universities. The following main knowledge transfer indicators were mapped (partly, more details are given in the next sections of the paper):

- size and age of the university;
- funding of R&D;
- publications;
- main facts about innovation support system;
- idea disclosers;
- academic patents (patent families) on inventions;
- new (spin-off) companies;
• license agreements, deals with IP, etc.

After gathering the required information some of the work was done in Uppsala and the rest in Tartu (results partly given in Table 1). The following research methods were used:
• analysis of written public documents and web-pages,
• analysis of internal documents on IP regulation and knowledge transfer at the universities,
• specification of data with key-persons,
• observation of procedures at UUI,
• compilation of case descriptions.

The authors also studied policy documents, legal regulations and background information concerning path-dependency in R&D, knowledge transfer, culture and technology.

Case 1: Knowledge transfer system at Uppsala University

Uppsala University (UU) was founded in 1477 and today it has 9 faculties. The number of students is 40000 (full time: 22000). The total number of employees was almost 5600, including 4000 academic employees (516 full professors) and the turnover was 5067 mSEK of which 3474 mSEK was used for R&D (approx. 69%) (2010).

Uppsala University conceptualizes itself as a traditional university which supports innovation. Innovation support is not narrowly defined only as technology transfer. UU has adopted a broad concept on industry-academia interaction which does not focus only on “the hard side of innovation support” conducted through licensing and spin-off creation but also gives a particular attention to “soft side” which means the establishment and support to sustainability and continuation of the existing industry-academia collaboration platforms (e.g. Ångström Materials Academy). When it comes to strategic collaboration with the industry (formation of different collaboration arenas) then no immediate results are expected. It is essential to promote collaboration in a structured way. It is crucial to define the strategic fields of innovation support and find companies for continuous collaboration for many years. Roughly speaking 50% of resources go to collaboration and 50% to knowledge transfer. There is a tendency that collaboration will use up 2/3 of the resources.

Since Uppsala University is not an independent legal entity (it is a governmental agency) it is not allowed under Swedish law to use its resources for patenting and investments in spin-off companies. Therefore, the innovation support system at Uppsala University is divided into two: Uppsala University Innovation (UUI) which is a structural unit of the university and the holding company UUAB Holding with UU Projekt AB (100% owned by UUAB Holding) and Forskarpatent (87% owned by UUAB Holding) as controlled companies. The innovation support system at Uppsala University also includes an advanced business incubator (UUAB Holding owns 25% of its shares) which provides services for university spin-off start-ups as well as non-university high-tech start-ups. UUAB has its own equity investment portfolio earnings which cover the initial expenditure on the university’s innovation structure development (approx. 5 million €).

Similarly to other Swedish universities Uppsala University acquired governmental approval to establish its holding company. When UUI tasks relate to enhancement of industry-academia collaboration then the holding company works with the actual knowledge transfer (licensing, spin-off and collaborative research). Both parts, UUI and UUAB Holding, are managed by the same manager as “two sides of the same coin”. One of the main achievements of UUI is its ability to involve industrial partners in collaborative research. This is creating additional funding for the university R&D exceeding heavily the income from own equity portfolio of UUAB Holding. The current system of innovation support has been in place around 12 years.

A particular feature influencing industry-academia collaboration in Sweden is the existence of professor’s privilege (teacher’s exception) as opposed to the institutional ownership which prevails in US and Europe (including Estonia). According to this principle the research results created at universities belong to the inventor not to the university. In case a researcher decides to exploit his or her invention through Uppsala University then according to the standard scheme of distribution of revenues (s)he is allocated 65% of the revenues (before exploitation costs are covered). After the exploitation costs are covered the researcher’s share is 75%. The rationale behind allocating a bigger share of profits to inventors is to motivate researchers to develop marketable knowledge and contribute to exploitation processes.
According to the practice in Sweden patents are not formally considered as publications. Patenting is encouraged with the belief that researchers working with the industry are better at doing research as well. There are always monetary incentives if researchers are successful.

A disclosure of a potential invention initiates several verification processes. UUI manages technical and business verification being in the driving seat of the process. Researchers are actively involved. Verification processes can be divided into two main types at Uppsala University: 1) technical verification and 2) business verification (market verification and business model verification). Technical verification concentrates on issues such as quality, scalability, robustness, cost of production, etc. During business verification marketability and protectability of knowledge, market size and other characteristics are analyzed. Results of verification processes could serve as additional incentives for the industry to be engaged in cooperation with the academia since there is more information about the potentially transferable knowledge.

Due to the smallness of the economy (market), the focus has mainly been on international markets from day one. Access problems do exist but they are no very serious. Sweden has been successful in establishing international cooperation with other universities in the world and domestic/foreign industry.

From 2006 to 2010 there were 381 disclosures of new ideas, 60 of them became projects where UUAB Holding or its subsidiaries made some kind of investment (not necessarily patent but including). During the same period 18 new companies were set up and 10 licensing deals concluded (>50 if transfer of patent rights from professors to spin-off start-ups are included to make it more comparable to the US-situation). Some 30 additional patent applications were filed using the support of UUI but sponsored by organizations other than the UUAB Holding or its subsidiaries, such as the governmental agency Innovationsbron, private foundations or paid by the inventors themselves. A total of 144 patent applications based upon inventions from UU researchers were filed during the period with the assistance of UUI patent office, 88 of them were priority filings and 58 were PCT applications.

Case 2: Knowledge transfer system at the University of Tartu

The University of Tartu (UT), founded in 1632, is the national university of the Republic of Estonia. Today it has 9 faculties and 5 colleges. The number of students is 18 000. The total number of employees is 3500, including 1700 academic employees (180 full professors). The budget volume for 2010 was 109 million Euros and approx. 37% of which goes to R&D.

The University of Tartu conceptualizes itself as a traditional university which supports innovation. Innovation support at UT is not confined to knowledge transfer but also facilitates general cooperation between the industry and academia. The industry-academia collaboration, however, is not managed in a structured and sustainable way. It can rather be characterized as undertaken on an ad-hoc basis. Greater emphasis is placed on actual knowledge transfer.

The regulatory framework underlying knowledge transfer conducted by Estonian universities differs from the Swedish model. Firstly, the University of Tartu is a legal entity and it is allowed to pay patenting costs and invest in spin-offs. A structural unit called the Institute of Technology is responsible for the industry-academia collaboration and knowledge transfer managed by UT. Secondly, according to the Estonian system research results are owned by the university (institutional ownership). The researcher, however, has the right to receive fair proceeds from the income received from the invention. The researcher’s share amounts to two thirds of the income received from an invention, from which the costs of legal protection of the invention and other like costs have been deducted (Principles governing IP at UT, 2006).

To incentivize researchers to cooperate during patenting process and not to publish an article relating to a patentable invention until a patent application is filed or not to publish an article at all (in case knowledge should be treated as trade secret) several mechanisms have been developed. Pursuant to the Estonian regulations concerning assignment of basic (2005) and targeted (2002) finances for research and development institutions a patent application and a granted patent equal to two or three high-level publications (articles in Thomson Reuters Web of Science database).

According to the Statutes of Research Degrees (2007) the University of Tartu accepts patents as a part of doctoral thesis which is an additional incentive for researchers to patent their research results.
Technical and business verification processes are not run in as structured and elaborate way as it is done at UUI. Similarly to Uppsala model, researchers are heavily involved in the knowledge transfer processes.

Since the Estonian economy is even smaller than the Swedish economy then UT is also focused on international partners. An adequate network is yet to be developed.

Findings and discussion

The main results of mapping general data and intellectual property issues and commercialization of R&D at two universities as described in two case studies above are presented in Table 1.

Table 1

<table>
<thead>
<tr>
<th>General data and indicators of R&amp;D commercialization by universities of Uppsala and Tartu</th>
<th>Uppsala University</th>
<th>University of Tartu</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Founded</strong></td>
<td>1477</td>
<td>1632</td>
</tr>
<tr>
<td><strong>Number of</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Students (full time)</td>
<td>40000 (22000)</td>
<td>18000</td>
</tr>
<tr>
<td>2) Employees</td>
<td>5600</td>
<td>3500</td>
</tr>
<tr>
<td>2.1) Academic employees</td>
<td>4000</td>
<td>1700</td>
</tr>
<tr>
<td>2.1) Full professors</td>
<td>516</td>
<td>180</td>
</tr>
<tr>
<td><strong>Legal status</strong></td>
<td>Governmental agency</td>
<td>Legal person in public law</td>
</tr>
<tr>
<td><strong>R&amp;D funding, M€</strong></td>
<td>350</td>
<td>40</td>
</tr>
<tr>
<td><strong>ISI publications, 2010</strong></td>
<td>2642</td>
<td>903</td>
</tr>
<tr>
<td>- per academic person</td>
<td>0.66</td>
<td>0.53</td>
</tr>
<tr>
<td>- expenses per publication, M€</td>
<td>0.132</td>
<td>0.0442</td>
</tr>
<tr>
<td><strong>Structure of innovation support system</strong></td>
<td>Innovation support system consists of two components: 1) Uppsala University Innovation (a structural unit of UU) and 2) UUAB Holding</td>
<td>Innovation support unit</td>
</tr>
<tr>
<td><strong>Time during which the current innovation support system has been in place</strong></td>
<td>12 years</td>
<td>10 years</td>
</tr>
<tr>
<td><strong>IP ownership regime</strong></td>
<td>Professor’s privilege</td>
<td>Institutional ownership</td>
</tr>
<tr>
<td><strong>Revenue distribution</strong></td>
<td>Inventor is allocated 65% of the revenues (before exploitation costs are covered). After the exploitation costs are covered the inventor’s share is 75%.</td>
<td>Inventor is allocated 2/3 of the income received from an invention (protection and other like costs deducted)</td>
</tr>
<tr>
<td>(IP is exploited through the university’s innovation support system)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>In order to encourage patenting, patents are considered as high level publications</strong></td>
<td>No but may be considered in favor for an applicant to a full professor position or a chair.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Extent of innovation support</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Transfer activities</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>1.1) Limited to technology (technology transfer)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>1.1) Wider than technology (knowledge transfer)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2) Enhancement of industry-academia strategic collaboration</td>
<td>Structured</td>
<td>On an ad hoc basis</td>
</tr>
<tr>
<td>2.1) Structured</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2.1) On an ad hoc basis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Business incubator as a structural unite of the university’s innovation support system</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
4) Investment (policy) into spin-offs

<table>
<thead>
<tr>
<th>Models of knowledge transfer includes licensing, spin-off and assignment</th>
<th>Yes</th>
<th>No</th>
</tr>
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<tr>
<td>Idea disclosures (2006-2010)</td>
<td>381</td>
<td>66</td>
</tr>
<tr>
<td>Accepted disclosures (Number of investment projects. Not necessarily patenting) (2006-2010)</td>
<td>60</td>
<td>53</td>
</tr>
<tr>
<td>New companies (2006-2010)</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>License agreements (2006-2010)</td>
<td>10 (&gt;50 if transfer of patent rights from inventors to a founded start-up company with UUAB Holding as a part-owner is considered)</td>
<td>14</td>
</tr>
<tr>
<td>Patents sold (2006-2010)</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>


Although Uppsala and Tartu universities both are leaders in R&D funding in their home country, the difference between their budgets is noteworthy – Uppsala surpasses Tartu 8.5 times. In knowledge production measured in ISI publications the difference is only 2.9-fold. The comparison of competitiveness of universities reveals that according to ARWU (2011) Uppsala University holds a 66th position and Tartu University has been placed among the top 600 in the world, (http://www.topuniversities.com/search/universities/Tartu). Pursuant to the THE Uppsala is 87th and Tartu has gained a position between 351 and 400 (http://www.timeshighereducation.co.uk/world-university-rankings/2011-2012/top-400.html). In QS World University Rankings® (2011) Uppsala occupies 83rd position and Tartu ranks between 501 and 550. Although the ranking positions of the universities are quite different, more important is the fact that both belong to 3-6 % of the world top universities.

The differences in indicators can also be explained by the countries of origin background, GDP per capita (PPP) of Sweden $39,100 (2010 est.) is twice as high as the corresponding indicator for Estonia $19,100 (2010 est.) (Index Mundi, 2011a,b). Sweden is known for its long-term R&D traditions, the share of funding has reached 4.25% (3.75% in 2008) of GDP in some periods (OECD, 2004, p. 23; Eurostat, 2011). Estonia had a several times lower GDP level just twenty years ago when independence from the Soviet system was regained bringing about the changing of societal paradigm, restructuring of economy and building up modern innovation system which started only in the 1990s. Therefore, the indicator for R&D funding being nearly 3 times lower (1.29% in 2008) in Estonia (Eurostat, 2011) is not a surprise.

The number of ISI publications as an indicator of knowledge production by academic employees is quite comparable in both universities: 0.66 per person in Uppsala and 0.53 – in Tartu (the difference 1.24X in productivity is not remarkable because the evaluation accuracy here depends on different roles of doctoral students, deviation in counting full time employees, lecturing hours, etc.). The expenses per publication demonstrate a nearly 3 times higher efficiency (productivity for money) at Tartu University.

Besides the size of funding R&D and number of scientific publications as indicator of knowledge production, more remarkable differences can be seen in handling of the created IP. As already mentioned the ownership of IP is differently regulated in Uppsala and Tartu. Researchers working at Swedish universities can patent their academic inventions themselves. They have several options between filing a patent application on their own, doing it through some company or university’s innovation support unit. Their Estonian counterparts, however, have to utilize innovation support system at their university and therefore follow the compulsory course of options.

The number of idea disclosers at UUI is approx. 6 times higher than registered in Tartu. The indicator reveals to a certain extent similar proportions as the survey of academic patenting by personnel of the Uppsala Roundtable universities (Mets, 2010b), where it reached 16…26 in favor of Swedish universities. Whether the number characterizes also knowledge production at the same rate of efficiency remains unknown. The high number of disclosures suggests at least a sufficient level of IP awareness.
Despite big difference in disclosures both universities have decided to fund almost the same number of projects. This statistical finding could create an impression that the innovation support system at the University of Tartu is more efficient than at Uppsala University. This conclusion could be supported by a number of direct license agreements which is higher in Tartu (see Table 1). This is, however, a fact which turns the tables around if the transfer of patent rights belonging to the individual professors when establishing a spin-off company based upon the invention is taken into consideration: over 60 in Uppsala against 14 at Tartu University. There is, however, one major difference between the universities in number of companies set up. When 18 new companies were founded within Uppsala’s system then none were founded within the innovations support system at the University of Tartu. Both numbers, transfer of knowledge in the form of license agreement or transfer of patent rights to start-up companies generally as well as university supported founding of new companies drastically favor Uppsala. The latter gives more industry-oriented context also to a number of investment projects of disclosers (mostly public funds in Estonia), and together with collaborative research demonstrates a much higher level of knowledge transfer in Uppsala.

The interpretation of this statistics is complicated since there is not enough information. Due to the confidentiality requirements it is not possible to reveal data concerning revenues these projects generate nor the funds invested in each project. The impact of the professor’s privilege and de facto professor’s privilege is also not perfectly clear. Though we can acknowledge that Uppsala innovation system is more competitive in terms of industrial implementation of privileged professors’ ideas than Tartu University with ideas of “non-privileged” professors.

**Conclusion**

Uppsala University and the University of Tartu have both declared that R&D, *i.e.* knowledge production, constitutes one of their main missions. Both universities are also leading institutions in their home countries. Production of knowledge as public good (ISI Web publications) in Uppsala and Tartu demonstrates generally good comparability of two universities.

A big gap between universities appears in numbers of protected academic IP as shown in previous studies (Mets, 2010b). The current research has revealed that IP ownership regime has a negligible impact on knowledge transfer from academia to industry. Although due to the existence of professor’s privilege in Sweden, Uppsala University Innovation is constantly faced with a competitive environment, nevertheless, it has benefited from its own equity investments as well as from collaborative research. In spite of the institutional ownership the University of Tartu is unable to produce similar or comparable results.

In conclusion we would like to emphasize the following aspects:

1) IP ownership regime (professor’s privilege vs. institutional ownership) does not have a considerable impact on functioning and performance of the knowledge transfer system of the studied universities;
2) the quality of business verification of IP, managerial capabilities, network access and established industry-academia collaboration platforms are more important than absolute numbers of patents;
3) the experience of Uppsala Innovation AB demonstrates that the aim of knowledge transfer is not to generate profit but to support economic development and to enforce the development of the parent university;
4) enhancement of a structured industry-academia collaboration (soft innovation support) is a crucial component in a functioning knowledge transfer system.

For a small country, patenting is practically the rule if trying partly to earn R&D costs back. At the same time there are obstacles such as low competencies as well as lack of resources in a small (post)transition country as identified in the mapping process above. As a result, the IPR system with „non-privileged” professors makes KT more inefficient if infrastructure is generally weak. It means that strict legal regulation on IP ownership can achieve its goals only if it is supported by the relevant knowledge transfer system and infrastructure.

It should not be forgotten that the direct income from KT system and IP ownership is merely the tip of the innovation iceberg. Social structures, university-industry linkages and competencies to run the collaboration constitute the rest of the innovation iceberg. These factors, however, are strongly undervalued in Estonia. It is crucial to understand that success with “hard side” of innovation support (knowledge transfer) requires more “soft” competencies in university-industry-government partnership.
Acknowledgements

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References


Два университета, два режима владения патентами: в чем заключается разница с точки зрения передачи информации?

Резюме

Широко распространено убеждение, что система интеллектуальной собственности (ИС) способствует инновациям. Однако, функционирование национальной инновационной системы (НИС) и взаимодействие между заинтересованными лицами в контексте передачи информации между промышленностью и академическими кругами отличается от страны к стране, в зависимости от экономического, социокультурного, правового и исторического контекстов.

Существуют три хорошо известных способа организации внедрения достижений университетской науки в экономику региона:
(1) выделение основанных на новых технологиях компаний, возглавляемых профессорами;
(2) высокоуровневая продажа лицензий в отношении новых технологий; и
(3) эффект «переливания» информации.

Два первых варианта передачи информации практически всегда задействуют патентованные технические решения или ноу-хау. Защита ИС в отношениях между университетами и промышленностью зависит от сочетания взаимных интересов партнеров, а также от того, как правительства в целом разрабатывают инновационную политику и НИС. Целью статьи является изучение практики передачи информации в контексте разной ИС университетами небольших стран в коммерческое использование и для выполнения дальнейших практических разработок. Для этого авторы анализируют режимы ИС (институциональная собственность или профессорские привилегии), а также их влияние на передачу информации от университетов промышленности; приводят примеры конкретных университетов и представляют используемую в исследовании методологию.

Защита и использование ИС стали неотъемлемыми компонентами концепции занятого предпринимательской деятельностью университета. Такие университеты должны следовать схемам патентования, сходным с используемыми частными компаниями. Университеты участвуют в связанном с информацией бизнесе, но не в качестве игрока на реальном рынке товаров и услуг, и поэтому они должны использовать более сложные патентные схемы, а постоянно стремиться выявить возникающие возможности и вызовы. Цели стратегического патентования не ограничиваются получением эксклюзивных прав, и распространяются также на «оборонительное» и «наступательное» патентование. Университеты также могут принять решение не патентовать свои изобретения, а публиковать их, или хранить в тайне. Стратегическое решение и части того, использовать патенты, модель коммерческой тайны или публиковать обладающие потенциалом патентования изобретения, зависит от возможностей организации осуществлять свои права, и от рыночной ценности информации.

Режим собственности в отношении результатов исследований является еще одним фактором, который следует принимать во внимание при управлении передачей информации. Можно выделить два разных режима: институциональная собственность (академическое изобретения находятся в собственности университета) и профессорские привилегии/исключения (академические изобретения находятся в собственности ученых). Американские и европейские университеты применяют в этой связи разные режимы. Если в США в эпоху до принятия закона Байна-Доуля, результаты исследований зачастую попадали в собственность финансирующих исследования государственных структур или промышленных спонсоров, в Европе доминировала концепция профессорских привилегий. Несмотря на исторические различия, развитие, и в Америке, и в Европе, двигается по направлению к концепции институциональной собственности. Проведенные исследования профессорских привилегий с фокусом на небольших странах выявили, что в течение лет, прошедших с момента изменения системы профессорских привилегий на систему институциональной собственности (что произошло в Дании в 2000
году), значительный объем деятельности в связи с патентами перешел от ученых к университетам. Принятие институциональной собственности даже могло создать дополнительные препятствия для передачи технологий, поскольку до реформы большая часть академических патентов принадлежала компаниям, т.е. информация уже была передана промышленному сектору. Сегодня, напротив, многие патенты остаются в академической среде, и никогда не передаются промышленности.

Эмпирические данные и анализ в данной статье приведены в отношении двух европейских университетов: Университета Упсалы (1477) в Швеции и Тартуского университета (1632) в Эстонии. Хотя университеты Упсалы и Тарту являются лидерами в финансировании исследований и разработок в своих странах, разница между их бюджетами весьма ощутима – бюджет Университета Упсалы (350 миллионов евро) превосходит бюджет Тартуского университета в 8,5 раз. С другой стороны, разница в производстве научной информации (измеряемом в публикациях ISI) составляет всего 2,9 раза. В мировом рейтинге университетов QS World University Rankings® за 2010/2011 годы оба этих учебных заведения входят в число ведущих: Упсала на 62 месте, и Тарту между 551 и 600 местом (в 2010 году). Эти индикаторы частично можно объяснить контекстом конкретных стран: ВВП на душу населения в Швеции составляет 39 100 долларов США (по оценкам на 2010 год), что в два раза выше соответствующего показателя в Эстонии – 19 100 долларов США (по оценкам на 2010 год). Швеция хорошо известна своей продолжительной традицией поддержки исследований и разработок: за непродолжительное время доля финансирования составила 4,25% ВВП (3,75% в 2008 году). Всего 20 лет назад ВВП Эстонии был в несколько раз ниже – тогда была восстановлена независимость от советской системы, что привело к смене общественной парадигмы, реструктуризации экономики и построению современной инновационной системы. Все это началось в 1990-х годах. Поэтому не вызывает удивления в три раза меньший индикатор финансирования исследований и разработок Эстонии (1,29% в 2008 году).

Количество публикаций ISI в качестве индикатора производства информации работниками академической сферы является в двух университетах вполне сопоставимым: 0,66 на человека в Упсале и 0,53 на человека в Тарту (разница в 1,24 раза не является критической, поскольку аккуратность оценки здесь зависит от разных ролей, которые играют студенты-докторанты, а также от разброса в подсчете работающих на полную ставку сотрудников, лекционных часов и т.п.). Расходы на одну публикацию демонстрируют почти в 3 раза более высокую эффективность Тартуского университета (в соотношении производительность к инвестициям).

Число порождающих идеи лиц в Упсале оказалось примерно в 6 раз выше, чем в Тарту.

Данное исследование показало, что режим собственности в отношении ИС имеет лишь незначительное влияние на передачу информации из академической среды в промышленность. Хотя в связи с существованием в Швеции профессорских привилегий Инновации Университета Упсалы существуют в конкурентной среде, на развитие повлияли собственные инвестиции и совместные исследования. Несмотря на институциональную форму собственности, Тартуский университет не может похвастаться сходными результатами.

В заключении, можно отметить следующее:

1) в исследованных университетах режим собственности в отношении ИС (институциональная собственность или профессорские привилегии) не оказывает заметного влияния на функционирование и эффективность системы передачи информации;
2) качество проверки ИС с точки зрения бизнеса, управленческий потенциал, сетевой доступ и сформированные платформы сотрудничества промышленности и академической среды являются более важным фактором, чем абсолютное количество патентов;
3) опыт Университета Упсалы показывает, что целью передачи информации является не только получение прибыли, но и поддержка экономического развития, а также развитие университета-учредителя;
4) улучшение структурированного сотрудничества между промышленностью и академической средой («мягкая» поддержка инноваций) является критическим компонентом в функционировании системы передачи информации.

Для небольшой страны при попытке вернуть часть расходов на исследования и разработки патентование практически не имеет альтернатив. В то же время, в условиях маленькой пережившей недавно переходный период страны существуют препятствия в виде низкого уровня компетентности и нехватки ресурсов – как это демонстрирует пример Эстонии. Результаты исследования показывают, что действующий в университете режим собственности в отношении ИС (институциональная собственность или профессорские привилегии) не оказывает заметного влияния на передачу информации. Организационные возможности, структурированное управление информацией и прочие компоненты инфраструктуры передачи информации имеют гораздо большее значение.